SIM

THE RELATIONSHIP BETWEEN CUE ABUNDANCE AND CUE AVAILABILITY, AND ITS IMPACT ON DETECTABILITY DURING POINT COUNT SURVEYS: A MONTE CARLO SIMULATION STUDY

ABSTRACT

Monitoring territorial bird populations usually entails sampling rather than enumeration. Sample results are often negatively biased by the failure to account for birds present but not detected. One source of such bias, undefined until recently, is “availability”, the probability that a bird that is present in the count area produces a cue that is potentially detectable. Availability is a precondition to detection, which may be constrained by ambient noise, sensory acuity of the observer, etc. The probability that a cue, once given, is detected by an observer, is “detectability.” Detection probability is the product of availability and detectability.

For aural counts, which are most often used with territorial land birds, such cues are typically songs or other sounds. I explored the underlying causes of availability, and methods for estimating it, with a Monte Carlo simulation model driven by the probability of singing and an independent probability of continuing a behavior (sing/not sing), once begun. According to the results of this simulation, song production is a linear function of probability of singing, independent of the probability of continuing and largely independent of the scale at which it is measured. It is relatively simple to estimate the probability of singing from song production rates during short point counts. Availability increases, in the model, as a power function of singing rate, with high probability of continuing reducing this power. These power functions should be estimable if estimates of continuation probability can be obtained, but the most obvious short-term estimator proved uncorrelated with continuation probability. The effort to find another estimator was abandoned because availability proved to be estimable directly from brief samples with linear functions.

I investigated the feasibility of estimating availability directly from data that can be collected easily during brief point counts, such as stops on the Breeding Bird Survey (BBS). One-minute estimates of singing rate (songs per minute) were poor predictors of availability, regardless of sample size, in line with the power relationship described above. On the other hand, the probability that a bird singing in the second half of the count period was also singing in the first half, when averaged over at least 25 samples, explained 90% of the variation in the true availability of the sampled bird. This probability is used in a recently published method for estimating detection probability (Farnsworth et al. 2002) that is based on capture-recapture logic. The results of this simulation study suggest that availability can be estimated easily on the BBS by dividing the count period in half and synonymizing the singers in the second half with those in the first.

AVAIL

THE RELATIVE CONTRIBUTIONS OF BIRD AVAILABILITY AND OBSERVER DETECTION RATES TO REPEATABILITY OF BBS RESULTS

ABSTRACT

A Breeding Bird Survey (BBS) route was simulated on the Patuxent National Wildlife Research Center, and four observers used standard BBS methods to survey 30 stops on this route eight times (twice per each observer) in a 11-day period in late summer of 2002. I transcribed their data and analyzed them for repeatability. Only the first 18 stops could be used for this analysis because of slight deviations in route after Stop 18. Qualitative and quantitative Sorensen similarity indices revealed substantial differences among days in the results of the surveys. Only a small amount of this variation was due to differences among observers. The two indices were highly correlated, indicating that differences in species detections, rather than differences in abundance estimates, were the major source of among-day differences. Species-specific detection probabilities (P) varied from .125 to .625, i.e., at best only about one-half of individuals (i.e., males) were detected on any given day. When these estimates were broken down into two components, availability and detection rate, it was found that the latter was approximately twice the former. These data suggest that it is most likely that natural variation in availability, the endogenous activity of the birds, that is the major source of negative bias in BBS data.

POST

USING OBSERVER-RECORDED TAPES TO ENHANCE A BBS SURVEY: AUGMENTATION BUT NOT SUBSTITUTION

ABSTRACT

The North American Breeding Bird Survey (BBS) is an important tool for monitoring the health of territorial landbird populations. Although the sampling protocol is well-designed to produce consistency of results across years and observers, improvements that (1) reduce identification errors and/or (2) increase detection ratio of vocalizing birds would be welcome. Post-processing of observer-recorded audio-tapes is one technique with the potential to improve results in one or both of these ways. To evaluate the potential of this technique, an experienced point-counter was engaged to post-process tapes recorded by BBS observers on four replicates of a simulated BBS route at Patuxent Wildlife Research Center in Maryland, USA. The interpreter used three protocols, in the following sequence: (1) Simply listening to the tape one time through without pausing, (2) Visually observing a realtime (moving) spectrogram while listening to the tape one time through without pausing, and (3) Unlimited audition and spectrographic visualization of the tape, with pausing and rewinding. The analysis for a stop-day was done at one sitting, and putative individual birds were synonymized across protocols. The count of putative individuals detected in this way was 920. Agreement between the first and final passes (Protocols 1 and 3) was 0.626, calculated as the proportion of individuals identified to species in the third pass also identified in the first pass. Similarly, agreement between passes 2 and 3 was 0.740. The results suggest that post-processing should not be limited to a single pass through the data, even with spectrographic visualization.

The results of post-processing were compared with those obtained by the realtime observers. Comparison of total individuals detected, by species, suggested that post-processing detected most of the birds within 50 m of the observer's location, plus some farther away, but failed to detect the more distant individuals. When a more sensitive analysis was conducted, it showed some to substantial disagreement between post-processing and the observers' data. Overall, the post-processing interpreter missed 54.6% of the individuals detected by observers, while the observers missed 25.9% of the individuals detected by the interpreter. Independent analysis of audio tapes confirmed at least 20% of these detections that were unique to post-processing. The results suggest that post-processing of audio-tapes with low-cost technology, while not adequate to replace realtime observers, could provide estimates of a component of detection probability by means of the double-observer method.

EQUIP

THE PROS AND CONS OF AUDIO-TAPING POINT COUNTS: EQUIPMENT CONSIDERATIONS

ABSTRACT

Monitoring of protected terrestrial birds is intensive for species at risk, including demographic analysis, but only population trend is estimated for the hundreds of low-risk species. Point counts are the main source of data on these lower-risk species, and aural cues are the main source of detections on point counts. Recording point counts presents a number of potential advantages over simple one-time audition in the field, but also poses new challenges. This study documents differences in the sensitivity of very low-cost ($60) consumer electronic equipment and low-end ($1500) professional equipment. On average, the professional equipment produced recordings with more target information, as reflected by the amplitudes of calibrated test sounds on the tapes. But, results were so variable from trial to trial that definitive recommendations of equipment cannot be made. As expected, recordings made in a forested environment were lower in amplitude than comparable recordings from an open field environment, presumably because vegetation in the forest absorbed or reflected more acoustic energy than did vegetation in the field. Nonetheless, recordings made with a professional microphone during a field test of auditory acuity of seven human subjects were at least as sensitive as the humans' ears, i.e., a higher percentage of test sounds was locatable on the tapes than the human subjects detected. Because these results are somewhat contradictory, more testing is needed. But, the potential usefulness of recordings in bird monitoring remains high.